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RANGE IMPROVEMENT



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NOTES

JULY 1965

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FOREST SERVICE — U. S. DEPARTMENT OF AGRICULTURE
INTERMOUNTAIN REGION — OGDEN, UTAH

STATEMENT OF PURPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developments and findings. These "notes" may include extracts of published work, unpublished reports on administrative studies and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

All who read these RANGE IMPROVEMENT NOTES are encouraged to submit material for publication, or suggestions for improving its usefulness. Full credit will be given for any material used.

MUCH KNOWN - MUCH TO LEARN ABOUT MANAGEMENT
OF
CRESTED WHEATGRASS*

By
H. M. Kilpatrick**

In every western state where winter feeding of forage is a common practice, hay stacks have a habit of dwindling or becoming unappetizing to livestock by the time the grass appears in the spring. Livestock are eager to leave their winter quarters.

For many years livestock men and public land administrators have realized that spring-fall ranges in the state have needed protection and improvement because the areas furnishing livestock feed during these grazing periods are relatively limited compared to the summer and winter range areas. The first attempt to defer spring ranges was made when crested wheatgrass was seeded in the state to provide for early spring grazing. Because crested wheatgrass is ready for grazing two to three weeks earlier than native grasses, crested wheatgrass use was actually a means of range deferment for the native grasses. With lessened grazing, especially too early grazing, the native ranges which have high value for summer grazing and as watersheds are being given an opportunity to improve naturally.

Renewed emphasis was given to crested wheatgrass seedings when halogeton was introduced into the United States and began its spread to spots in the range which had been disturbed or where the vegetation lacked vigor and density and did not provide competition to this poisonous, annual invader.

Crested wheatgrass was observed to be less palatable to cattle than the native bluegrasses, ricegrasses, and fescues. Crested wheatgrass was treated like native grasses and grazed rather lightly; as a result, the seed stalks from previous years' growth hindered livestock from utilizing the plants uniformly and "wolf plants" soon appeared in many of the crested wheatgrass seedings. It was not until crested wheatgrass seedings were fenced and animals held on the grass did utilization increase and so did livestock weights. It was generally believed that only mature cows could utilize crested wheatgrass, but continued research with this important

*From Range and Livestock Management-Cooperative Extension Service -

Max C. Fleischmann College of Agriculture - University of Nevada

**Range and Pasture Specialist

grass has shown from several states that yearling gains from the first of May to the 15th of June were constantly above 2 pounds average daily gain.

It is well know, from crude protein analysis of crested wheatgrass, that nutritionally crested wheatgrass is inadequate in July and August until the seed heads are formed and livestock can utilize the grain produced. A test in Oregon, comparing native grasses with crested wheatgrass during August of 1956 and 1957, using yearlings on both native and crested ranges indicates that animals do better on crested wheatgrass range. A two-year average for August grazing shows that yearlings gained an average of .78 pounds per day on crested wheatgrass as compared to .49 pounds on native forage.

Sheep men thought of crested wheatgrass as a cattle feed and presumed that sheep would do poorly on it; however, today many sheep men use crested wheatgrass seedings for spring lambing. Research has demonstrated that now sheep men are getting more lambs per ewe, with faster gains, and more sheep to the acre on crested wheatgrass than on native range.

In New Mexico crested wheatgrass was more satisfactory than the native grasses in increasing ewe weights during the spring lambing period. Sizable losses in weight resulted on the native range and heaviest grazed wheatgrass in the drought year of 1959; however, during drought, with light grazing intensities, ewes gained weight. Lamb crops were 4.5 to 7.1% larger when ewes lambled on crested wheatgrass than on native ranges, and death losses were 1 to 3% less on crested wheatgrass than on native range.

To secure the greatest benefits from lambing on crested wheatgrass pastures, a suggested initial stocking rate is 75 sheep days per acre. Another way of estimating the sheep days per acre would be to measure utilization of crested wheatgrass. Utilized between 50 and 60% will provide highest sustained yields of both grass and returns to the operator.

When moisture is received in the fall months, crested wheatgrass, being a cool season grower, greens up and livestock can once again utilize it during this time of the year. Even if there is no green-up period in the fall, the seed heads are clipped by livestock and they stay in healthy condition.

Some operators are reserving their crested wheatgrass fields for late fall and even winter use. While we know that nutritionally crested wheatgrass is low in winter, it saved livestock herd liquidations and enabled ranchers in Lincoln County to maintain breeding herds during drought years when cattle were placed on these seedings during the winter.

Continued research is being done to supplementing crested wheatgrass areas during the fall and winter to determine what levels of supplementation would be most beneficial and economical.

* * * * *

S A F E T Y

A positive attitude towards
Safety, when expressed, is
like measles - CONTAGIOUS!

* * * * *

It is very easy to forgive others their mistakes; it takes more grit and gumption to forgive them for having witnessed your own.

Jessamyn West

* * * * *

Some tasks have to be put off dozens of times before they are completely forgotten.

ADAPTABLE, TRANSPORTABLE UTILIZATION CAGES*

By
Neil C. Frischknecht
and
Paul W. Conrad**

Several types of cages for protecting small areas from grazing have been described. A limitation of most cages is that they are bulky and cumbersome. Some range managers have solved the transportation problem by constructing cages on the sites where they are to be used. This paper describes a cage designed to fold flat for ease in transporting; one that is sturdy, moderate in cost, and adaptable to plots of different sizes. Cages can be constructed during slack work periods and later transported to field location by pickup or packhorse in much larger numbers than non-folding designs.

The basic construction employs panels of welded wire, hinged together by No. 9 wire threaded through a series of wire loops at the edges of each panel. Cages shown in Figure 1 will accommodate a 9.6-square-foot plot, a convenient size for determining herbage yields (Frischknecht and Plummer, 1949). The four-sided cage constitutes the basic design but when sampling needs require larger plots, the number of panels can be increased to enclose larger areas. A cage 5 feet square accommodates a 9.6-square-foot plot, five panels will accommodate a plot twice that size, and two cages (eight panels) joined together will easily enclose a 96- or 100-square-foot plot (Figure 2). The larger cages are advantageous for protecting large shrubs, patches of vegetation, and areas of sparse vegetation on desert ranges.

In addition to reducing damage from rubbing by cattle, a pyramidal design increases cage stability and reduces the cost per panel. The amount of cost reduction depends upon the angle of cut. Cages should be large enough so that plot vegetation will not protrude through the sloping sides.

When eight 5-foot-long panels (two cages) are to be joined, the panels should be cut at an angle of about 76° from the horizontal. Procedures for cutting panels from different types of welded wire are shown in Figure 3. Cages having an even number of panels will fold flat if the panels are

*From Journal of Range Management (Technical Reports), Volume 18, No. 1, January 1965

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of equal size. When an odd number of panels is joined, one wire stay must be removed to permit cages to fold flat.

The size and number of panels needed to protect an area of a given size can easily be determined. The following formulae give the radius of the circular area that would be inscribed by joining various numbers of panels of equal size (where "L" = length of one side):

No. of panels	Cage shape	Radius
3	triangular	0.2887L
4	square	0.5000L
5	pentagonal	0.6882L
6	hexagonal	0.8660L
7	heptagonal	1.0383L
8	octagonal	1.2071L

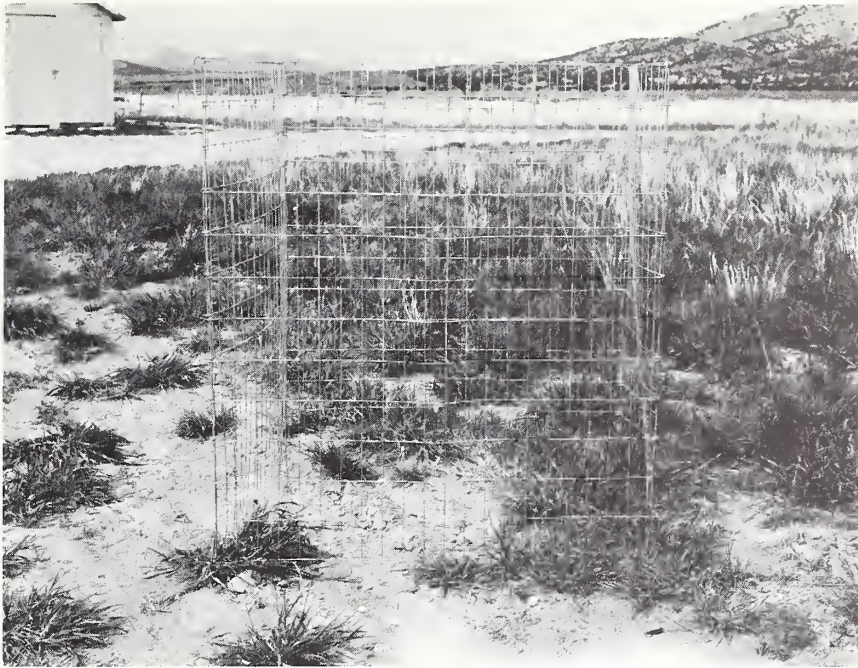
Cages of the type shown in Figure 1 proved satisfactory on sheep and deer range in 1963. In an attempt to reduce rubbing by animals, only pyramidal cages were used on cattle range. The 50 cages tested were not molested during 30 days of early spring grazing on crested wheatgrass range pastures, but some cages were damaged later in the season after bulls were added to herds. Cages were also damaged on another treeless seeded range where cattle congregated in a swale. Horned animals were believed to be responsible for major rubbing damage. Trampling of the bottom wire was the most prevalent abuse, but did not cause as much serious damage as did rubbing. The authors are studying whether using certain types of welded wire and changing the angle of cage slope would further reduce molestation by cattle.

* * * * *

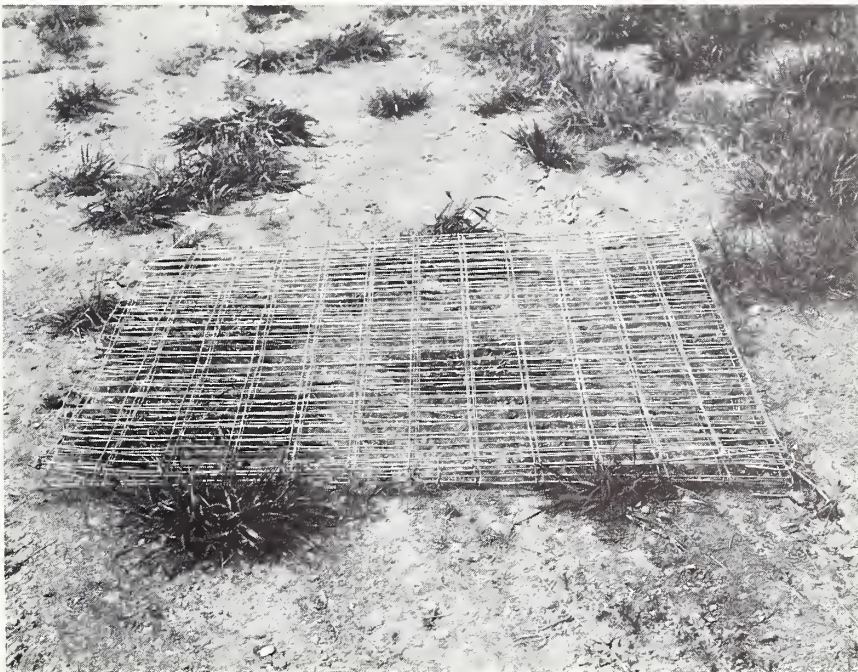
Daring ideas are like chessmen moved
forward; they may be beaten, but they
may start a winning game.

Goethe

Figure No. 1



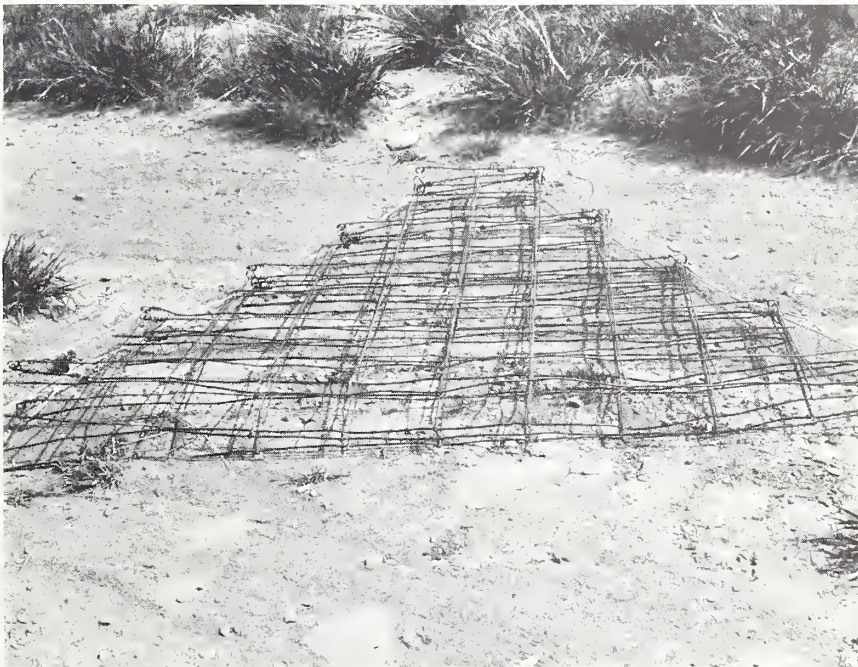
Vertical-panel, open-top cages of welded wire (2- by 4-inch mesh) proved satisfactory on sheep and deer range.



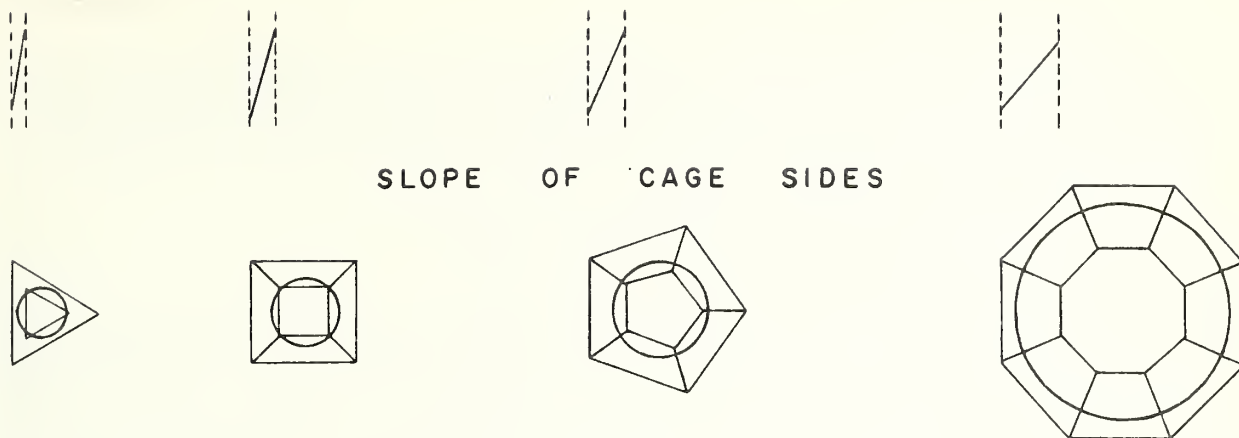
When folded flat, relatively large numbers of these 4- by 4-foot cages can be transported by pickup or packhorse.



Pyramidal cage of No. 10 welded wire (6- by 6-inch mesh) was not molested by cattle during 30 days of early spring grazing. A 3/8-inch iron stake in the center of each panel holds cage rigid.



Cages fold flat for ease in transporting.



SLOPE OF CAGE SIDES

Scale: 1/5 inch = 1 foot

Figure 2 - Diagram of four cage structures produced by varying the number of panels. For these cages the basic panel would be welded 4- by 4-inch wire mesh, cut on the following dimensions; base, 5 feet; height, 5 feet; top, 32 inches. Areas enclosed by circles within each diagram (left to right) correspond to plots of 4.8, 9.6, 19.2, and 96 square feet respectively.

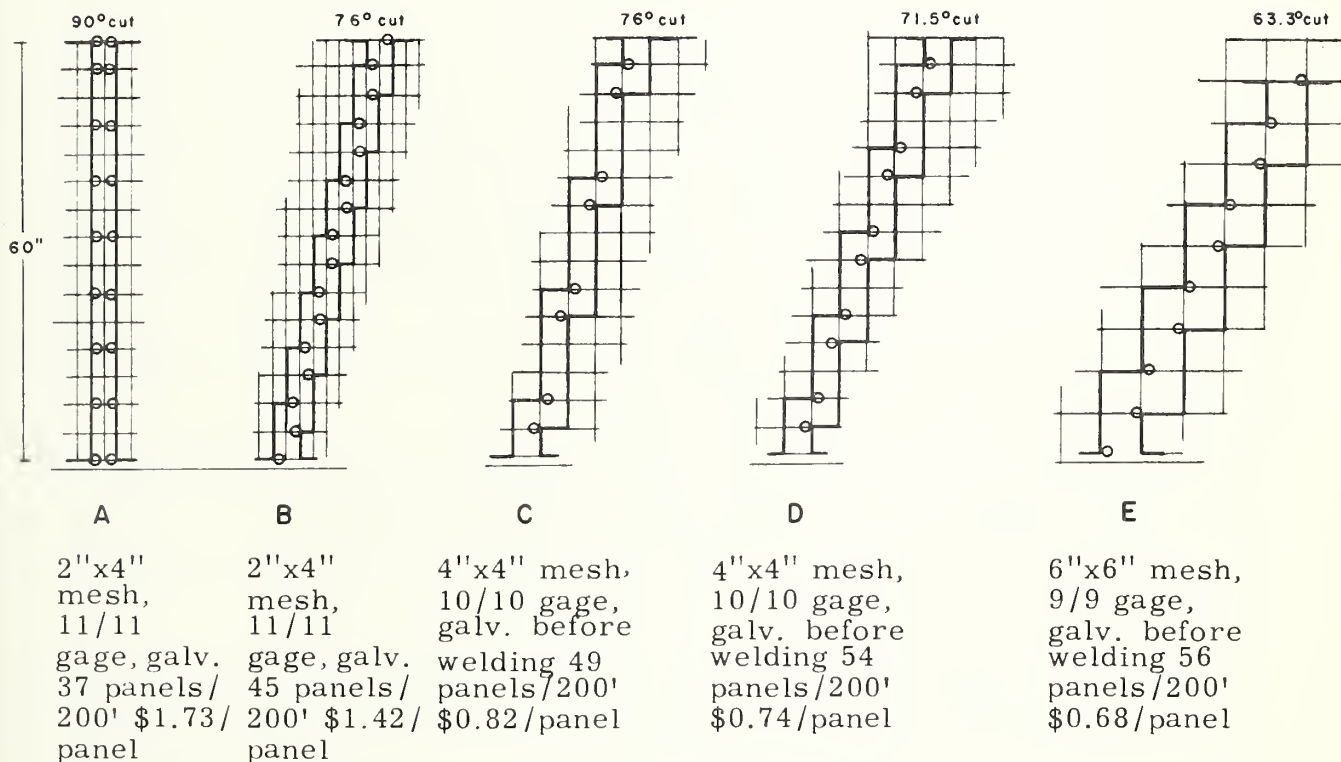


Figure 3 - Diagrams for cutting panels and information on approximate cost of 5- by 5-foot panels for three types of welded wire. Loops are formed from horizontal wires as shown - other wires between panels are cut off. Diagrams A and E were used for cages in Figure 1, left and right respectively.

THE INFLUENCE OF SLOPE GRADIENT, DISTANCE FROM WATER, AND OTHER FACTORS ON LIVESTOCK DISTRIBUTION ON NATIONAL FOREST CATTLE ALLOTMENTS OF THE INTERMOUNTAIN REGION

By
Thomas A. Phillips*

Obtaining uniform livestock distribution on cattle range is a major management problem. Given free choice, cattle distribute themselves over a range in such a manner that some areas receive heavy use while others receive light use or are completely ignored. The distribution pattern that develops is largely determined by slope gradient, distance from water, aspect, species composition, herding, and the distribution of - and distance to - salt and shade. The study presented here was established to determine the degree to which these factors influence livestock distribution on typical National Forest cattle allotments.

The study was conducted during September and October of 1963 and 1964 on 12 cattle allotments on 3 National Forests in Idaho and Nevada. Utilization was used as an indirect measure of livestock distribution on the range. One hundred sixty-two utilization transects were run on the allotments on various slope gradients and at various distances from water. The transects were located at 5 to 10 chain intervals along a selected route of travel that led up slope and away from water. The transects were run roughly at right angles to the route of travel and along the contour of the slope. Utilization was determined by the weight estimate method using .96-square-foot plots situated at one-half chain intervals along a ten-plot transect. Distance between transects was recorded in chains and was measured by pacing. Slope gradient was measured between consecutive transects along the route of travel.

Transects were run at distances from water ranging from 1 to 137 chains, and on slope gradients ranging from 0 to 63 percent. Data recorded in addition to slope and distance from water were aspect, distance to salt and shade, species composition, and whether or not a full-time rider was employed on the allotment.

None of the allotments were managed under a rest-rotation system of grazing; most were divided into spring and summer units, with the spring units being used until around July first and the summer units for the rest of the grazing season.

Two vegetative types were used in the study - grass and sagebrush. Utilization estimates were limited to grass species as little or no grazing use

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was evident on the forb and browse plants. Twenty-one grasses were encountered on the transects. Table 1 shows the frequency of occurrence and average utilization on these species.

Table 1. Frequency of occurrence and average utilization on 21 grass species on transects situated on varying slope gradients and at varying distances from water.

Scientific Name	Species Common Name	Frequency 1/	Average
		%	Utiliza- tion %
<i>Festuca idahoensis</i>	Idaho fescue	89	56
<i>Agropyron spicatum</i> & <i>inermis</i>	Bluebunch wheatgrass	52	36
<i>Stipa columbiana</i>	Subalpine needlegrass	30	50
<i>Poa pratensis</i>	Kentucky bluegrass	22	75
<i>Agropyron trachycaulum</i>	Slender wheatgrass	20	40
<i>Carex</i> spp	Sedge	20	51
<i>Poa ampla</i>	Big bluegrass	18	69
<i>Poa nevadensis</i>	Nevada bluegrass	17	71
<i>Bromus marginatus</i>	Big mountain brome	15	34
<i>Sitanion hystrix</i>	Squirreltail	15	30
<i>Stipa lettermanii</i>	Letterman needlegrass	15	44
<i>Elymus cinereus</i>	Great Basin wildrye	7	63
<i>Agropyron smithii</i>	Western wheatgrass	7	35
<i>Koeleria cristata</i>	Prairie junegrass	7	48
<i>Hesperochloa kingii</i>	Spikefescue	4	58
<i>Agropyron cristatum</i>	Crested wheatgrass	3	57
<i>Agropyron saxicola</i>	Wheatgrass	3	38
<i>Stipa occidentalis</i>	Western needlegrass	1	75
<i>Muhlenbergia richardsonis</i>	Mat muhly	1	79
<i>Deschampsia caespitosa</i>	Tufted hairgrass	1	70
<i>Juncus</i> spp	Rush	1	0

1/ The percentage of all transects upon which the species occurred.

Idaho fescue and bluebunch wheatgrass were the dominant species, occurring on 89 and 52 percent of the transects respectively. Use on Idaho fescue indicated moderate palatability, while bluebunch wheatgrass rated rather low in this respect. Other grasses showing high palatability and fairly high frequency of occurrence were Kentucky bluegrass, big bluegrass, and Nevada bluegrass.

Average utilization was based on the two or three species in the stand showing the heaviest use. Because of its widespread occurrence and relatively high palatability, Idaho fescue was used as the main key species

in the study. Other highly palatable species were used with Idaho fescue when they were locally abundant on a transect, but where they occurred only in trace amounts, utilization was based solely on Idaho fescue.

Effects of Slope Gradient and Distance From Water

Utilization decreased rapidly as slope gradient and distance from water increased; however, slope gradient influenced utilization to a greater extent than did distance from water (Figure 1). For example, at 10 chains from water, utilization averaged 64 percent on a 10 percent slope gradient, but only 27 percent on a 30 percent gradient, and 11 percent on a 50 percent gradient.

Utilization decreased most rapidly within 10 chains of water on all slope gradients, but the rate of decrease per chain of distance from water became more pronounced with increased slope gradient (Table 2). On the 10 percent slope gradient, use declined at the rate of 3.6 percent per chain increase in distance from water; while on the 30 percent gradient, the rate of decrease was 7.2 percent per chain. The highest rate of decrease occurred on the 50 percent slope gradient where use declined at the rate of 8.9 percent per chain of distance from water.

Utilization was evident at a much greater distance from water on the gentler slopes than on the steeper slopes. Discernible use extended to approximately 100 chains from water on the 10 percent slope gradient, but only to 23 chains on the 30 percent gradient, and to 14 chains on the 50 percent slope gradient.

Table 2. Decrease in utilization per chain increase in distance from water on average slope gradients of 10, 30, and 50 percent.

Average Slope Gradient %	Distance from water in 10 chain intervals						
	0-10	11-20	21-30	31-40	41-50	51-60	61-70
	Percent Decrease in Utilization per Chain of Distance from Water						
10	3.6	1.8	1.1	0.7	0.5	0.5	0.4
30	7.2	2.5					
50	8.9						

Figure 1.
Decrease in utilization with increasing distance from
water on average slope gradients of 10, 30, and 50 percent.

Utilization
%

100

90

80

70

60

50

40

30

20

10

0

Slope gradient 0 - 20%
Average 10%

Slope gradient 21 - 40%
Average 30%

Slope Gradient 41+%
Average 50%

Distance From Water (Chains)

70

60

50

40

30

20

10

Effect of Salt

Salt significantly influenced utilization at all distances from water. Average utilization increased 12 percent at 5 to 10 chains from salt grounds where such grounds were located within 60 chains of water. Beyond 60 chains, utilization decreased regardless of the presence of salt, but the rate of decrease per chain of distance from water was much lower in areas where salt was present. The characteristic use pattern was one of heavy use in the vicinity of water; decreasing use away from water to within approximately 10 chains of salt; then increased use in the vicinity of salt; followed by a rapid decline in use beyond salt in the direction away from water (Figure 2).

Effect of Shade

Shade and salt influenced utilization in a similar manner (Figure 3). On areas between shade and water, utilization increased 10 percent at a distance of 10 chains from shade, but then decreased rapidly beyond shade in the direction away from water.

Effect of Aspect

Average utilization was 7 to 13 percent lower on north exposures than on south, east, or west exposures. Heaviest use, and the widest spread in use, occurred on the 0 to 10 percent slope gradient interval. As slope gradient increased, utilization declined on all exposures and the spread in utilization among exposures gradually narrowed. On 0-10 percent slope gradients, utilization averaged 54 percent and was 17 to 22 percent lower on north exposures than on other exposures, while on a 45 percent gradient, utilization averaged 4 percent and was 0 to 7 percent lower on north exposures than on other exposures (Figure 4). It is not clear why utilization was significantly lower on north exposures. Lighter use could be expected on steep north exposures due to the adverse effects of shade on forage palatability. However, this was apparently not a factor on this study since the widest spread in utilization occurred on the gentler slopes where shading would have little effect on forage palatability.

Effect of Herding

Full-time riders were employed on 6 of the 12 allotments sampled in this study. On the remaining six allotments, salt distribution and riding were accomplished by the permittees. A comparison of average utilization at various distances from water and on various slope gradients for the two sets of allotments indicates that riding did not greatly influence livestock distribution (Figure 5). Utilization decreased rapidly with increasing

Utilization
%

60

50

40

30

20

10

0

Figure 2

Effect of salt on utilization in areas between salt and water and in areas beyond salt and away from water. (Salt grounds less than 60 chains from water and on slope gradients less than 20 percent)

30

20

10

Salt

10

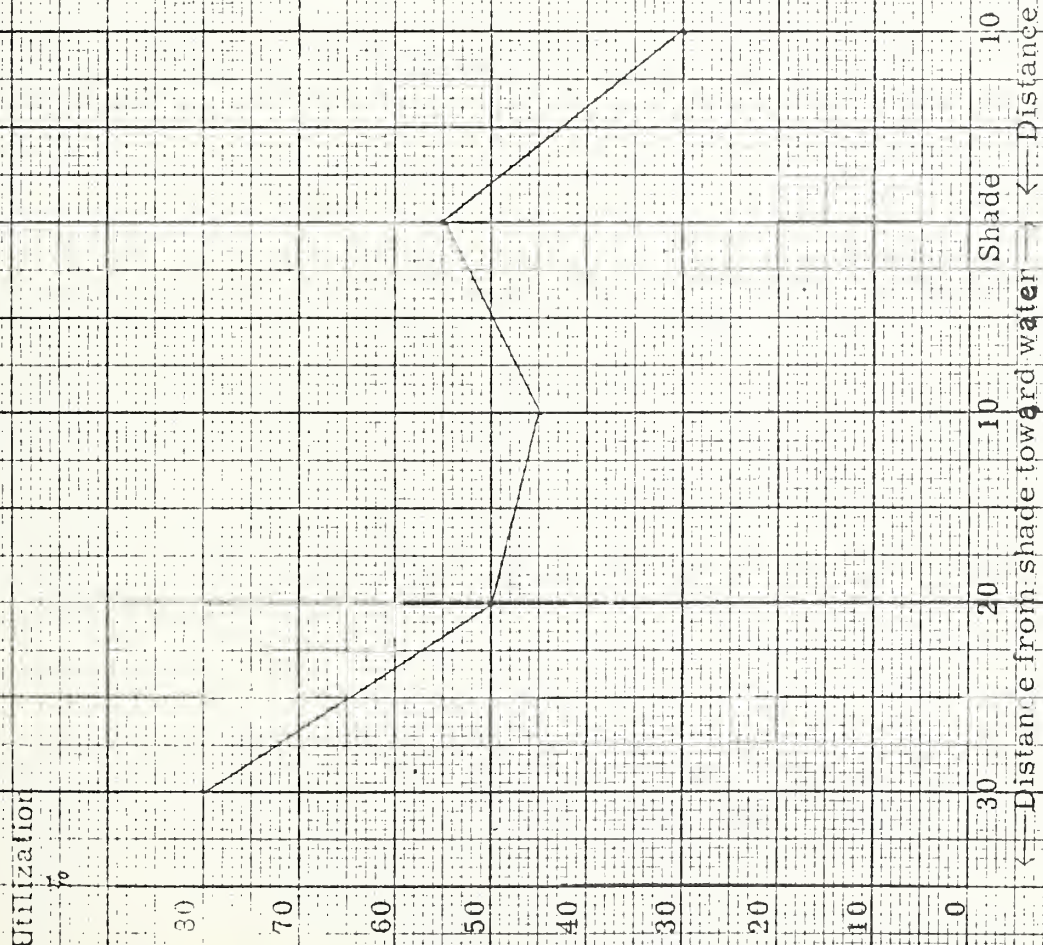
20

30

← Distance toward water (Chains) → Distance beyond salt away from water (Chains) →

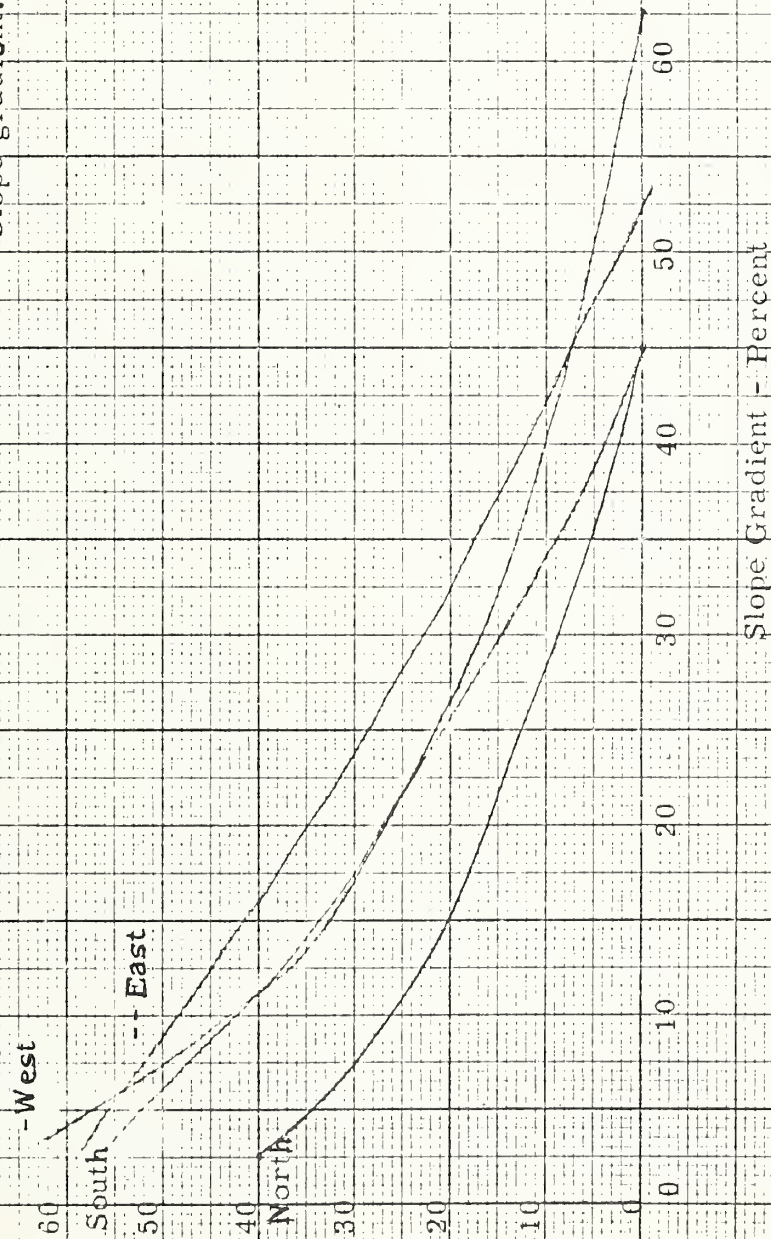
Figure 3

The effects of shade on utilization in areas between shade and water and in areas beyond shade and away from water.
(Slope gradient less than 20%.)



Utilization
%

Figure 4
Utilization by aspect with increasing
slope gradient.



Utilization

%

80

70

60

50

40

30

20

10

0

Figure 5. Utilization with increasing slope and distance from water on six allotments with full-time riders and on six allotments without full-time riders.

Alotments without full-time riders

Alotments with full-time riders

0-10% Slope
0-10 Chains

11-30% Slope
11-30 Chains

+31% Slope
+31 Chains

Slope Gradient and Distance From Water

slope gradient and distance from water on both sets of allotments, but use averaged approximately 10 percent lower on the allotments having full-time riders. This difference in use remained constant up to 30 chains from water and on slope gradients up to 30 percent, but beyond these limits there was no significant difference in utilization.

Use Patterns

The use pattern revealed by this study is one that is common on most National Forest allotments. It is characterized by heavy use on relatively level areas near water, and by light use on areas distant from water and on steep slopes. The pattern is most conspicuous on areas of steep terrain, where enormous variation in utilization occurs over a relatively short distance. This phenomenon of steep terrain is clearly demonstrated in Table 3.

Table 3. Average utilization on 7 transects situated in canyon bottoms compared with utilization on 7 transects situated on adjacent canyon slopes.

<u>Site Location</u>	<u>Average Utiliza- tion %</u>	<u>Average Slope Gradient %</u>	<u>Average Distance From Water (Chains)</u>
Canyon Bottoms	78	4	3
Canyon Slopes	5	59	7

These data show a decrease of 73 percent in utilization over a distance of seven chains. The decrease was obviously due to slope gradient.

Heavy utilization was the rule in canyon bottoms even at a considerable distance from water. For example, average utilization on 10 transects run in canyon bottoms was 64 percent at an average distance of 8 chains from water. At 30 chains from water, utilization still averaged 60 percent, a decrease of only 4 percent over a distance of 18 chains. On one of the 10 transects used in this study, utilization was 69 percent at 65 chains from water, and on another transect, 65 percent use was recorded at a distance of 50 chains from water. The study gave some indication that heavy utilization is not necessary to force cattle use on areas away from water in canyon bottoms. In a lightly used canyon, utilization was 30 percent at a distance of 15 chains from water, while at 100 chains, utilization was still 25 percent, a decrease of only 5 percent over a distance of 85 chains.

In areas of moderate terrain (15 to 30% slope gradients), the use pattern characteristic of steep terrain still prevailed, but to a somewhat lesser extent. Considerably more use was evident on the slopes, but utilization was significantly heavier in the shallow swales that occur along the slopes than on the low ridges separating the swales. This relationship is shown in Table 4.

Table 4. Comparison of utilization in a canyon bottom with utilization on an adjacent slope in swales and on ridges between swales.

Transect	Slope %	Distance From Water (Chains)	Average Utiliza- tion %	Average Utilization on Plots	
				In Swales (Concave Slopes) %	Between Swales (Convex Slopes) %
Canyon Bottom	5	2	58	-	-
Transect #1	15	5	35	48	20
Transect #2	20	15	22	41	10

As indicated in Table 4, utilization decreased as slope gradient and distance from water increased, but use was from two to four times heavier in the shallow swales along the slope than on the areas between swales. This pattern was also noted in the draws running down slope from ridge tops to canyon bottoms. Utilization was always heavier in the draw bottoms than on the adjacent slopes. Use was consistently heavier on ridge tops than on adjacent slopes. For example, nine transects terminated on ridges and, on seven of these, heavier use was recorded on the ridge tops than on the adjacent slopes; however, the difference in average utilization between the two areas amounted to only 4 percent.

Summary and Conclusions

1. A definite pattern of use was evident on the allotments sampled in this study. Utilization by area in descending order of use was (1) canyon bottoms and flat areas near water, (2) relatively flat areas more distant from water, (3) swales (concave slopes) and draws on slopes adjacent to canyon bottoms and flats, (4) ridge tops, and (5) areas between swales (convex slopes) on slopes adjacent to canyon bottoms and flats.
2. Slope gradient was the major factor influencing the use pattern. Utilization decreased significantly on all slope gradients, but the decrease was most pronounced on the steeper slopes.

3. Extremely heavy use in the canyon bottoms did not materially increase utilization on the steep slopes adjacent to the canyon bottoms. On the steepest slopes, utilization reached 0 within 10 chains of water.
4. Distance from water was the second major factor influencing the use pattern. Where slope was not a factor, utilization decreased rapidly the first 10 chains from water. Beyond this point, use declined at a lesser rate and utilization reached zero at approximately 100 chains from water.
5. Herding and the use of salt altered the use pattern to some extent, but not enough to attain uniform utilization on all slope gradients or at all distances from water.
6. Salt and shade influenced utilization in a similar manner. Utilization decreased as distance from water increased, and then increased in the vicinity of salt and shade. Beyond salt and shade, utilization decreased rapidly in the direction away from water.
7. This study indicates that even with herding and the judicious use of salt, little utilization can be expected on slope gradients exceeding 20 percent at any distance beyond 10 chains from water. This is true even when utilization is extremely high on level areas near water. On less steep areas, fairly uniform utilization can probably be attained at a distance of one-half mile from water. Canyon bottoms, flats, concave slopes, and draw bottoms on slopes adjacent to canyon bottoms will generally fall in this category. On most National Forest cattle allotments, these areas will comprise the suitable range.

* * * * *

Out of intense complexities intense
simplicities emerge.

Winston Churchill

* * * * *

The trouble with the average family
is it has too much month left over
at the end of the money.

Bill Vaughan

JOHNSON'S AUTOMATIC SELF-OPENING
AND
CLOSING STOCKYARD GATE*

Several of these are in use on the Butte District of the Deerlodge National Forest. It is not electrically charged. "Fish pole" type arms are spring hinged to swing into place after vehicle has passed through. Forest people say it is very effective. It is sold by Glenn (Penny) Johnson, 1063 Road 9, Route 2, Powell, Wyoming.

The Deerlodge says it costs about \$75 installed when bought in lots of five or more. Brochures say it can be converted to electric fence gate when desired.



*From Range and Wildlife Digest - Northern Region, U.S. Forest Service, December 1964.

GATE FASTENING DEVICE*

Range Conservationist Clarence Almen closing a wire gate fastened with a strap-iron device. These fasteners are used on the Grand River District of the Custer National Forest. Such devices are not new and have been in use in some localities for many years. They are very effective in closing and fastening wire gates. We know of no commercial source, but they can easily be made by any blacksmith.



*From Range and Wildlife Digest, Northern Region, U.S. Forest Service, December 1964.

